Chapter 1 Proposed Project

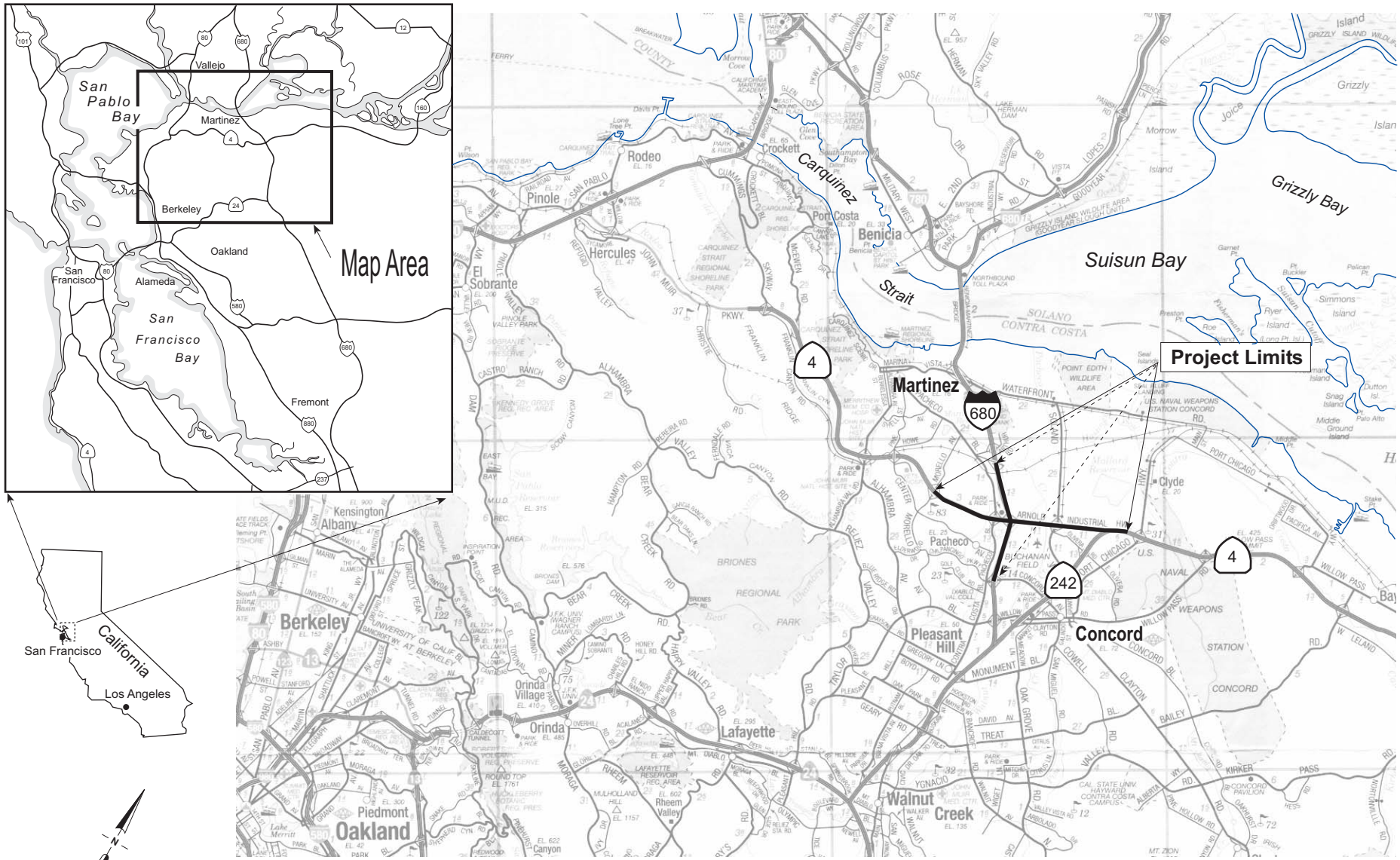
1.1 Project Description

1.1.1 Introduction

The California Department of Transportation (Caltrans) is the lead California Environmental Quality Act (CEQA) agency for the project, and the Federal Highway Administration (FHWA) is the lead National Environmental Policy Act (NEPA) agency. In this project, the Contra Costa Transportation Agency (CCTA), Caltrans, and FHWA propose to make improvements to the Interstate 680 (I-680)/State Route 4 (SR-4) interchange in Contra Costa County (Figure 1-1). The existing facility is a full cloverleaf freeway-to-freeway interchange. Growth in traffic since the original construction of this interchange four decades ago has exceeded the capacity of some directional movements. Traffic congestion is partly due to the high existing volumes but is also attributed to specific constraints associated with the current inadequate ramp spacing and lane configurations (primarily short weaving and merging sections, described in Section 1.2). Making capacity improvements to this interchange provides the opportunity to improve safety by eliminating some of the most congested weaving and merging locations.

1.1.2 Background

Reconstruction of this interchange has been formally considered since the early 1980s. As described in more detail in Section 1.4, preliminary concepts that would provide freeway-to-freeway connections with greater capacity were developed in the early 1990s that could replace the existing slower-speed loop ramps and closely spaced ramp configurations that currently constrain traffic flow. A lack of available funding limited actions to planning for a future interchange and identifying the areas immediately surrounding the existing State right-of-way from potentially encroaching land use development. As traffic congestion and delays increased at this interchange due to growth in traffic volumes, a Project Development Team (PDT) consisting of Federal, State, and local transportation planning representatives evaluated and completed a Project Study Report (PSR) in 2001 that recommended specific actions that could be implemented to improve traffic conditions and accommodate anticipated future traffic volumes that will result from planned regional and local growth.



Source: AAA, San Francisco Bay region, 1997

URS	Project No. 26812934 I-680/SR-4	PROJECT VICINITY MAP	Figure 1-1

The PSR resulted in identification of a preferred action, called Alternative D2A, which was used to prioritize the planned improvements evaluated in this report.

1.1.3 Interchange Improvement Phases

The planned improvements identified for Alternative D2A consist of five independent phases that can be implemented as funding is available. The details of each of the phases are summarized below and illustrated in Appendix A. Additional features of Alternative D2A are described in Section 1.3.1.

The existing northbound I-680 to westbound SR-4 and eastbound SR-4 to southbound I-680 traffic movements are the most impacted by the existing interchange's design and capacity constraints (see Section 1.2.2). Figure 1-2 shows the entire interchange project limits, and Figure 1-3 shows an enlarged detail of the interchange connections. Phases 1 and 2 of the project would improve capacity and safety for those directional movements. Transportation funding has been identified for the first two phases. Phases 3 through 5, considered future phases as no immediate funding has been designated, are illustrated in Figures 1-4 and 1-5. Figure 1-6 shows existing and proposed typical cross sections of different segments of the interchange.

1.1.3.1 Phase 1

Phase 1 would replace the northbound I-680 to westbound SR-4 loop ramp with a two-lane connector ramp that passes over both I-680 and SR-4. Auxiliary lanes would be added on northbound I-680 from the Concord Avenue on-ramp to the connector ramp and from the connector ramp to Morello Avenue. The existing loop ramp would be removed and the existing auxiliary lane on westbound SR-4 would be lengthened to the divergence point of the westbound SR-4 to northbound I-680 diagonal ramp and SR-4. The design of Phase 1 (and Phase 2, described below) allows for the addition of local access ramps between Pacheco Boulevard and I-680, called "slip ramps." The slip ramps are described in detail in Section 1.3.1 and are shown in Figures 1-2 and 1-3 and in Figures A-i, A-ii, A-4, and A-11 within Appendix A. The Phase 1 slip ramp would require the relocation of the Blum Road/Pacheco Boulevard intersection 95 meters (312 feet) to the north and the modification of the existing Caltrans Park and Ride lot.

1.1.3.2 Phase 2

Phase 2 proposes a new eastbound SR-4 to southbound I-680 ramp with auxiliary lanes from the Morello Avenue on-ramp to the connector and from the connector to the Concord Avenue off-ramp. Phase 2 would also extend the existing auxiliary lane

from the Muir Road/Pacheco Boulevard intersection to the eastbound SR-4 on-ramp and the eastbound SR-4 to northbound I-680 loop ramp. The existing diagonal ramp would be removed in this phase. Including a slip ramp at this location would create a connection between I-680 and Pacheco Boulevard. The connector ramp would be two lanes wide, but if the slip ramp were included in the project, a total of three lanes would follow the point where the slip ramp merges with the connector ramp (see Appendix A, Figure A-4).

1.1.3.3 Phase 3

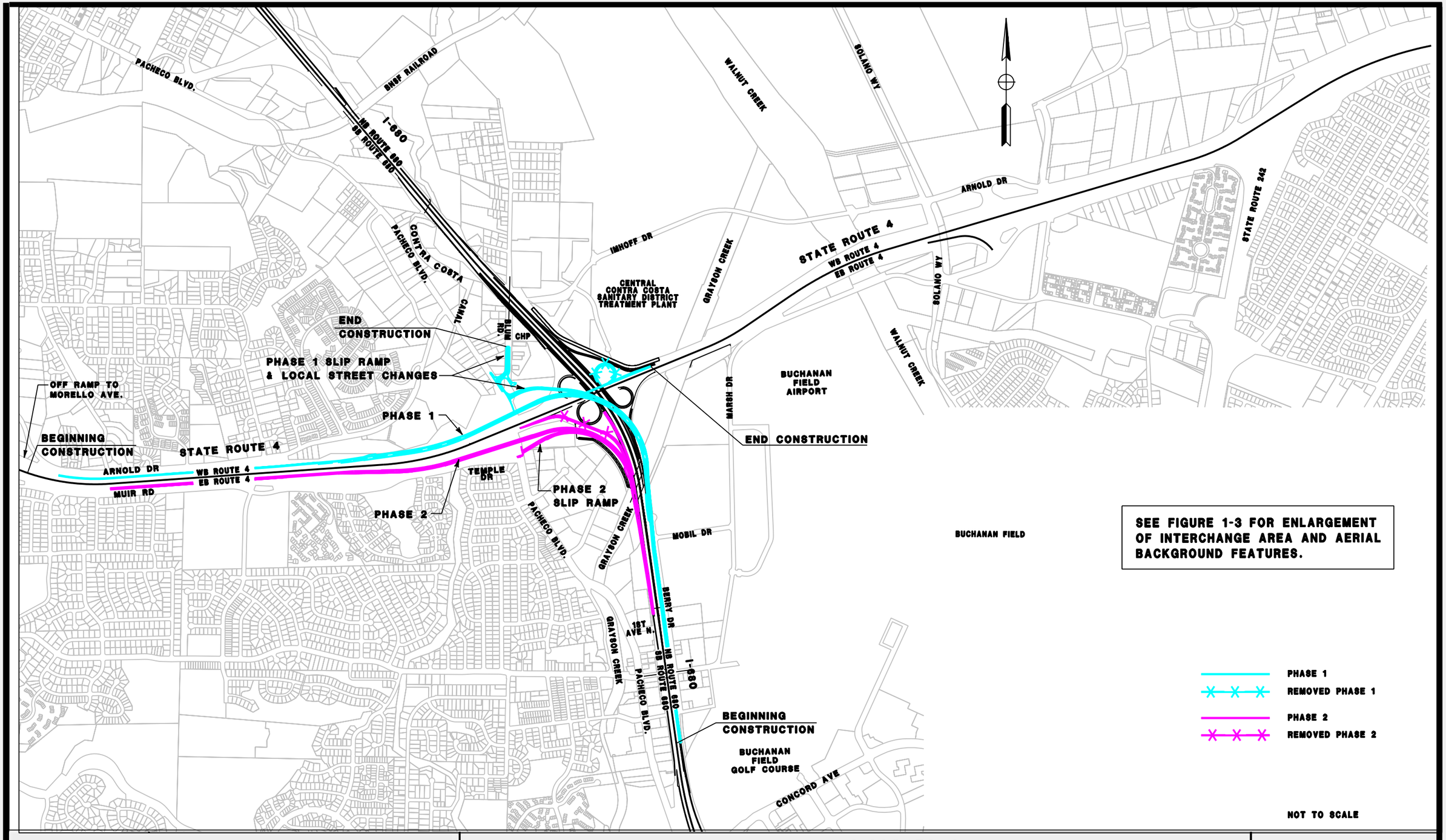
Phase 3 would add one eastbound lane and one westbound lane in the existing median of SR-4 in the vicinity of I-680. This phase adds capacity to SR-4 within the interchange area, allowing through traffic to better avoid on- and off-merging activity associated with the ramps and connections. The limits of this phase are from just west of the SR-4/Pacheco Boulevard and SR-4/Muir Road on- and off-ramps to just east of the State Route 242 (SR-242) interchange. Phase 3 would provide a longer distance in which drivers can change lanes outside of the immediate vicinity of the ramp connections, thereby spreading out some of the existing points of overlapping traffic movements and congestion.

1.1.3.4 Phase 4

Phase 4 would consist of a southbound I-680 to eastbound SR-4 direct-connector flyover ramp. It also would eliminate the existing southbound I-680 to eastbound SR-4 loop ramp. An auxiliary lane would be constructed on eastbound SR-4 from the connector to the Solano Way off-ramp. These changes result in a new higher-capacity direct connector and eliminates two congested weaving sections from the existing interchange (the existing southbound I-680 to SR-4 east off- and on-weaves, where southbound I-680 cars approach and enter the loop off-ramp, and then exit the same loop ramp onto eastbound SR-4).

1.1.3.5 Phase 5

Phase 5 would provide a westbound SR-4 to northbound I-680 direct connector to replace the existing diagonal ramp connection. This improvement provides a higher-capacity direct connector at a location that is functioning at very low levels of service in the morning commute direction. Two additional improvements would be made to the westbound SR-4 to southbound I-680 direction: the loop ramp in the northwest quadrant of the interchange (serving the westbound SR-4 to southbound I-680 movement) would be widened from a single lane to two lanes, and the



Contra Costa Transporation Authority	**I-680/Rte4 Interchange Vicinity Map, Proposed Project Phases 1 and 2**	**Figure 1-2**

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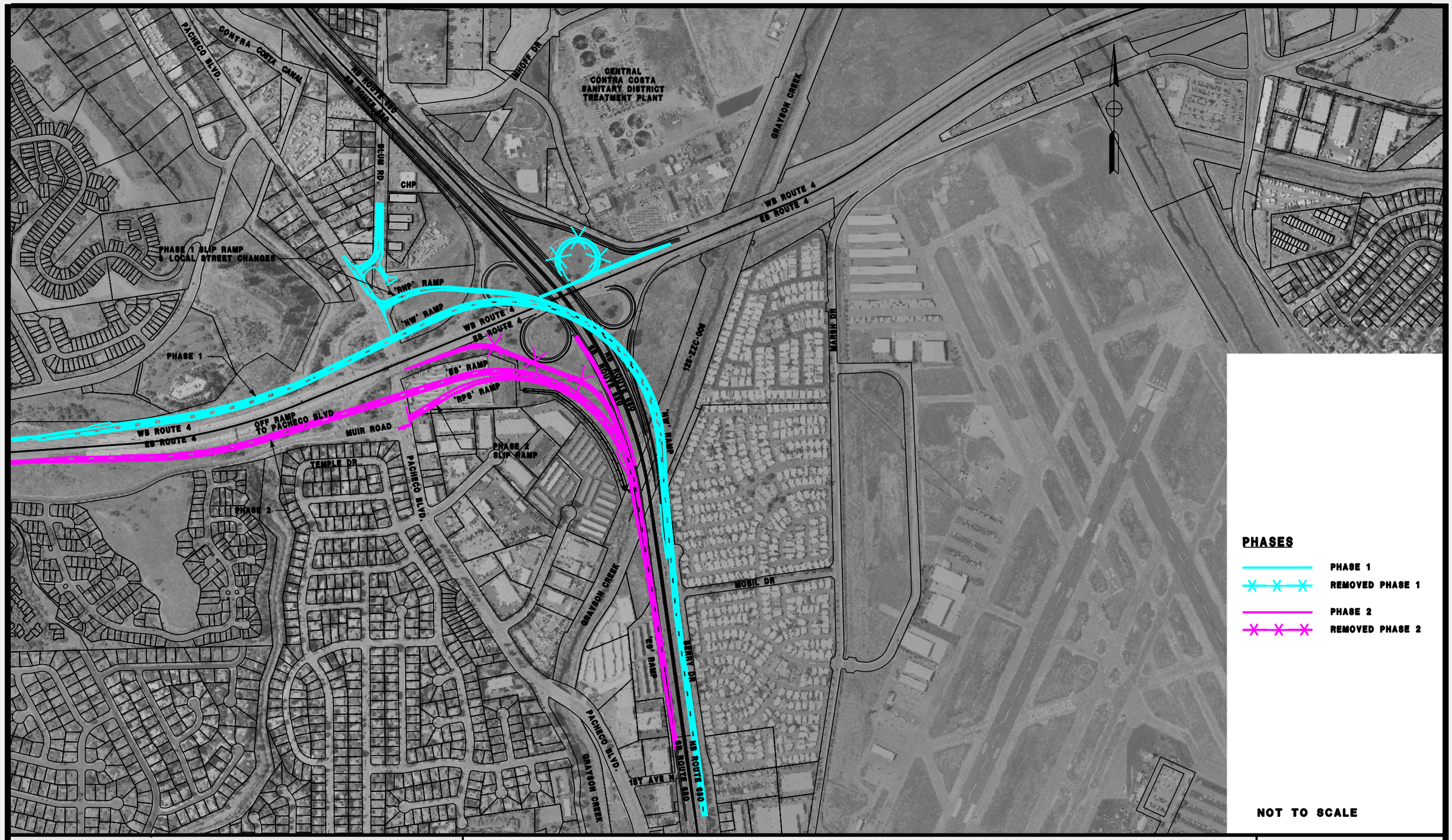

Contra Costa Transportation Authority	Project Area Phases 1 and 2	Figure 1-3

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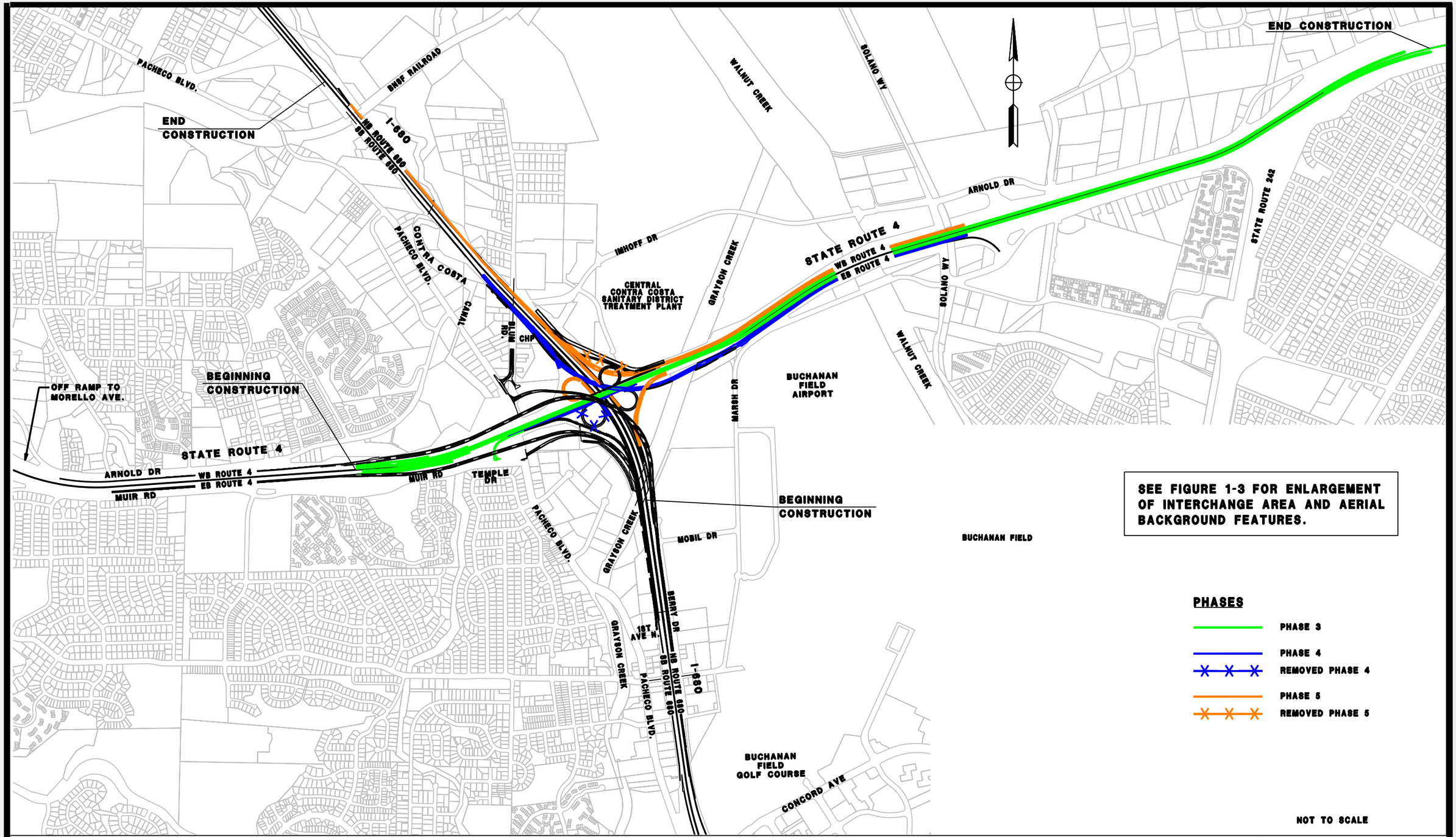

Contra Costa Transportation Authority	**I-680/Rte4 Future Phases 3, 4 and 5**	**Figure 1-4**

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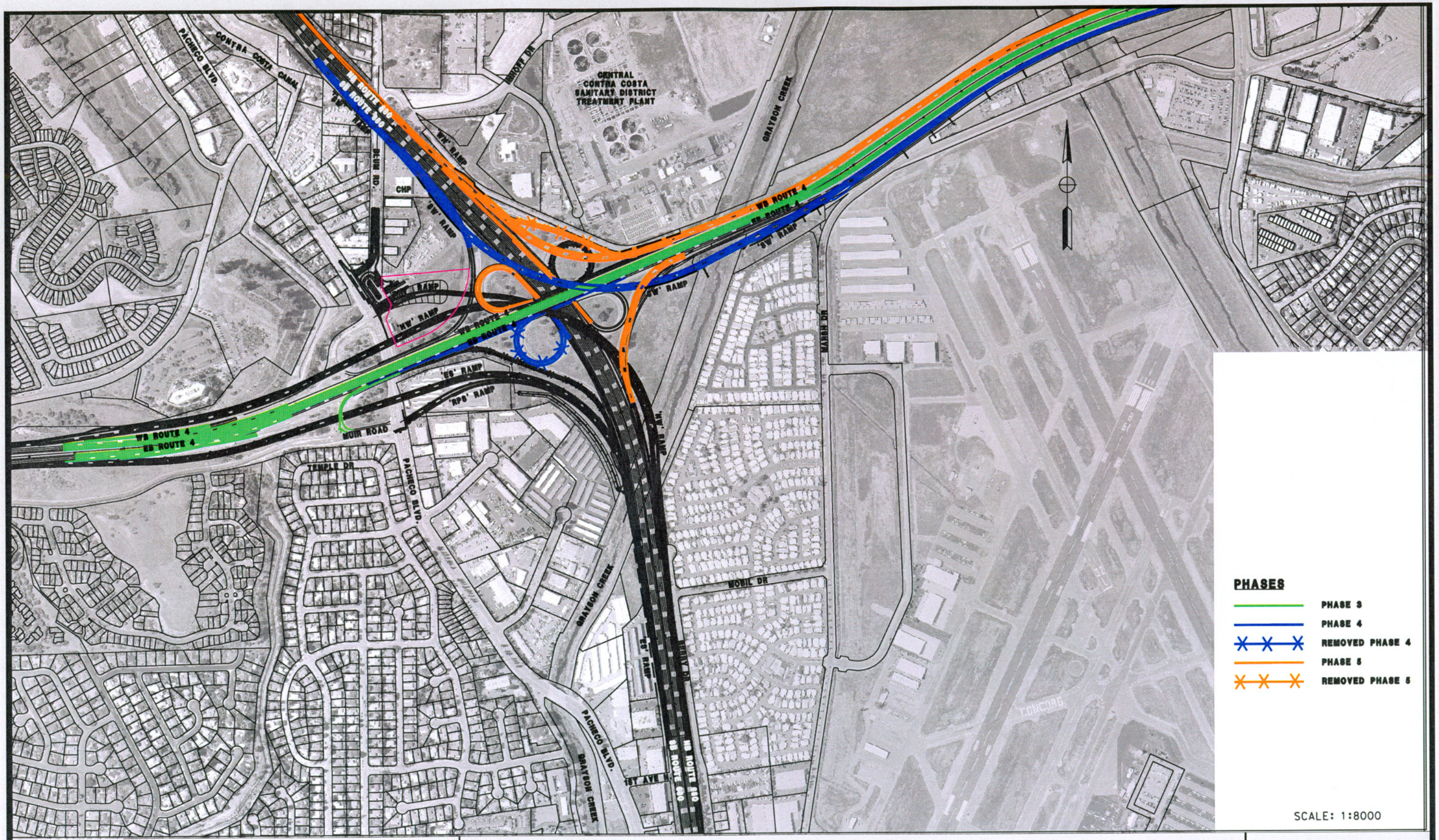

Contra Costa Transportation Authority	**Project Area with Future Phases 3,4, and 5**	**Figure 1-5**

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DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No	TOTAL SHEETS
04	CC	680	32.0 - 36.5		
04	CC	004	16.6 - 23.6		

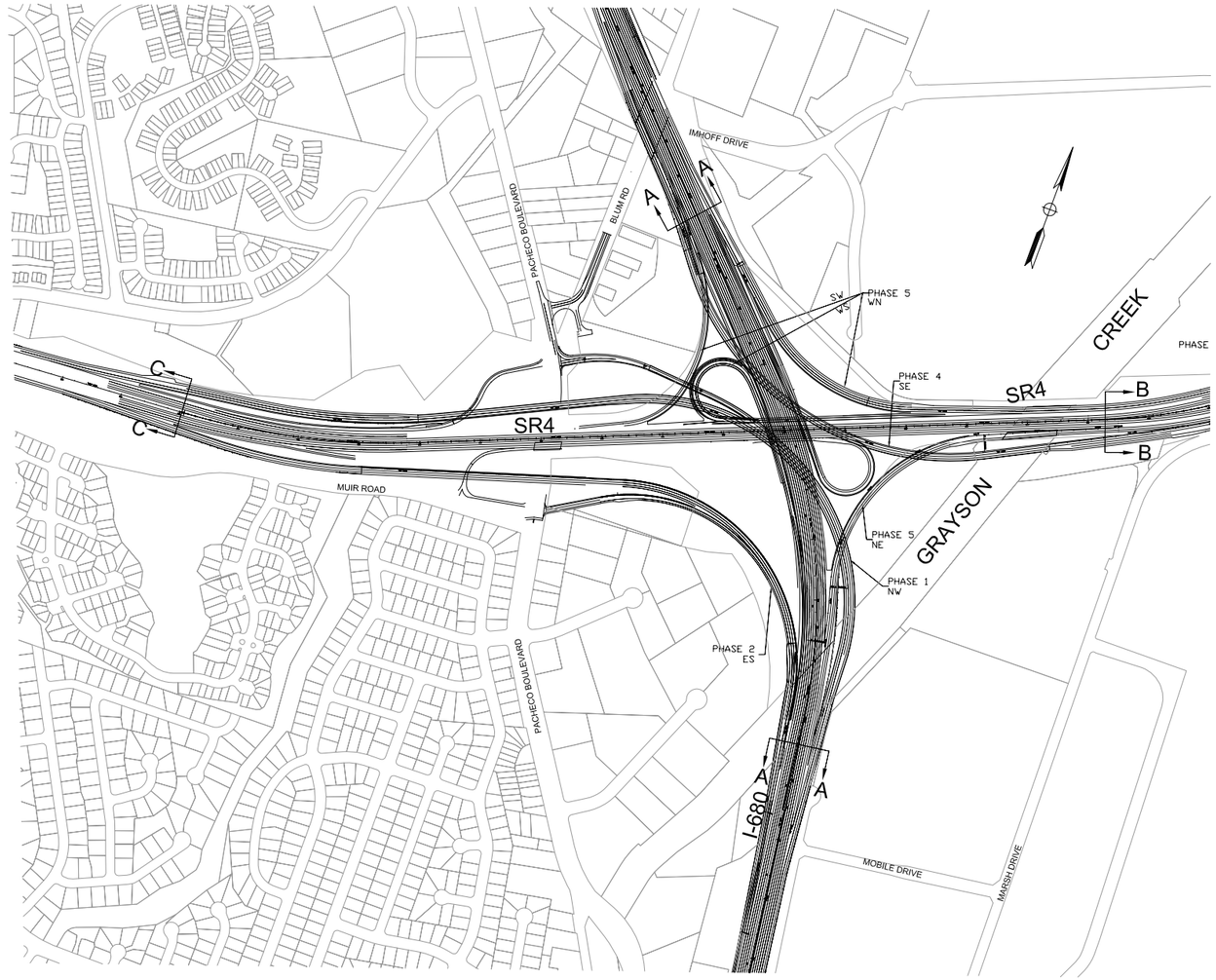
REGISTERED CIVIL ENGINEER

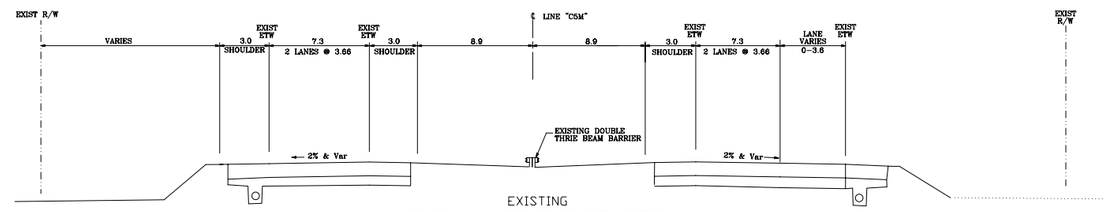
REGISTERED PROFESSIONAL ENGINEER — No. — Exp. — STATE OF CALIFORNIA

PLANS APPROVAL DATE

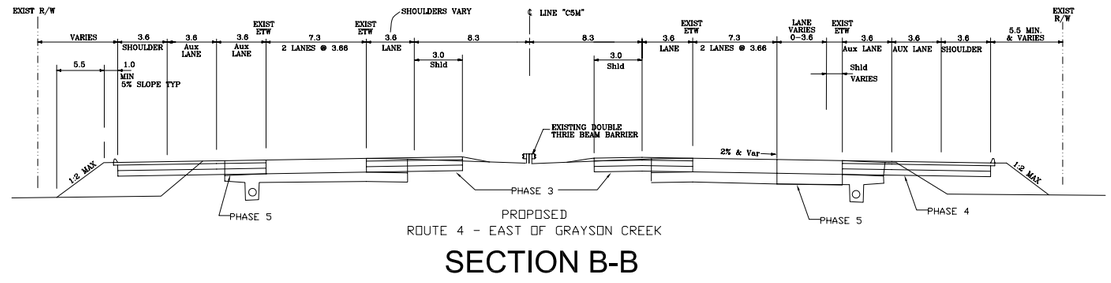
URS CORPORATION
1333 Broadway Suite 800
Oakland, CA 94612

Caltrans Metric



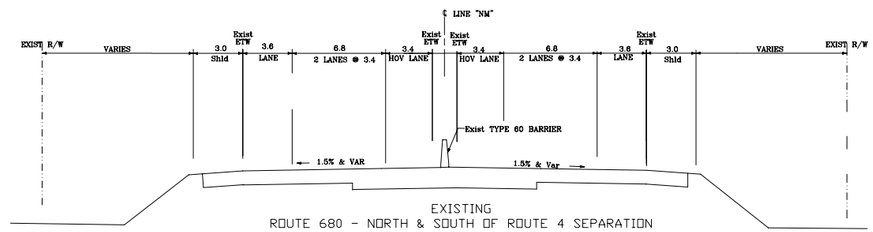


EXISTING
ROUTE 4 - EAST OF GRAYSON CREEK

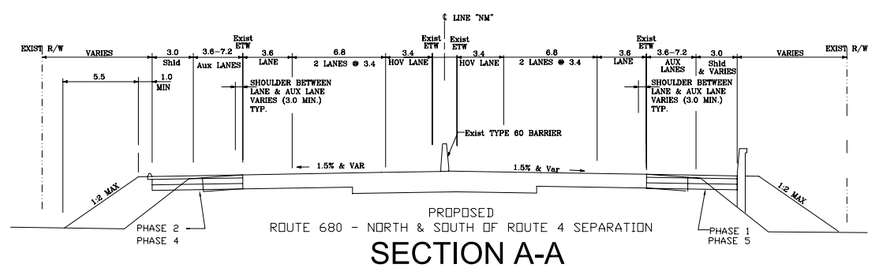


PROPOSED
ROUTE 4 - EAST OF GRAYSON CREEK

SECTION B-B

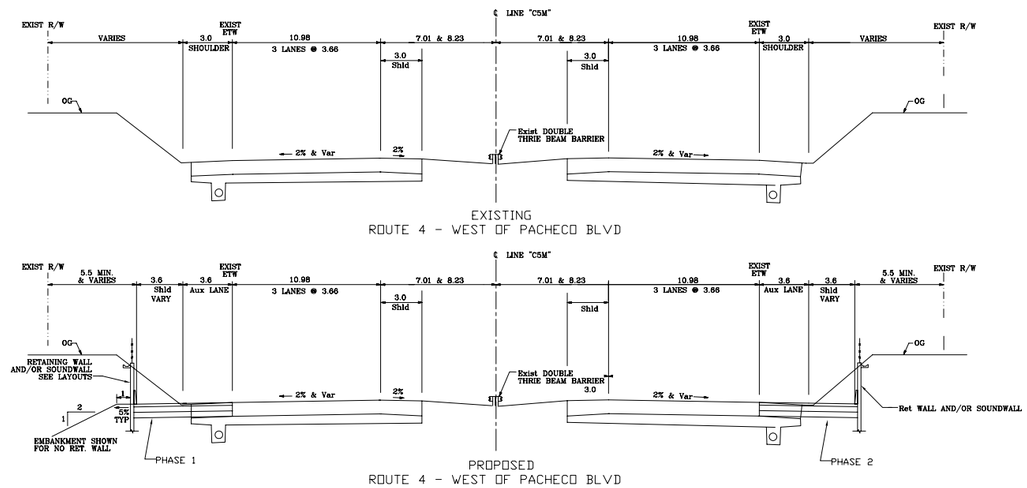


EXISTING
ROUTE 680 - NORTH & SOUTH OF ROUTE 4 SEPARATION



PROPOSED
ROUTE 680 - NORTH & SOUTH OF ROUTE 4 SEPARATION

SECTION A-A



EXISTING
ROUTE 4 - WEST OF PACHECO BLVD

PROPOSED
ROUTE 4 - WEST OF PACHECO BLVD

SECTION C-C

NO SCALE

FIGURE 1-6
LOCATION & CROSS SECTION MAP

I680/SR4 INTERCHANGE

LATEST REVISION

DATE	REVISED BY	DATE REVISED
ML	-	
SK		

CALCULATED/DESIGNED BY
CHECKED BY
PROJECT ENGINEER

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans

Dec 16, 2005 - 3:44pm
X:\x_tss\ZIP\x_trans\I-680Rt4\CAD\Enviromental Document\X Sections\Layout.dwg

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS

USERNAME => $USER
DGN FILE => $REQUEST

CU 00000

EA 10-3A1300

existing one-lane diagonal ramp in the southeast quadrant would be replaced to provide a two-lane ramp. During geometric review of the Draft Project Report, the replacement proposed for the diagonal ramp in the southeast quadrant was identified as a means to improve the curvature of the existing ramp, providing enhanced sight distance for motorists. These improvements are proposed to meet the anticipated future increase in traffic demand for the westbound SR-4 to southbound I-680 directional movement.

The proposed design is compatible with other recently completed and currently planned transportation improvements in the area, including the I-680 High-Occupancy Vehicle (HOV) Lane Project, the new Benicia-Martinez Bridge, the SR-242 widening project, and planned improvements along Pacheco Boulevard.

1.2 Purpose and Need

1.2.1 Project Purpose

The purpose of the project is to:

- Improve operational efficiency of the I-680/SR-4 interchange and reduce traffic congestion and delays
- Improve safety by eliminating short weaving and merging sections
- Provide direct local access between I-680 and Pacheco Boulevard
- Accommodate existing and planned growth in travel demand within these segments of I-680 and SR-4

1.2.2 Project Need

The I-680/SR-4 interchange, built in the 1960s, is unable to accommodate current traffic patterns and volumes. Contra Costa County has planned for growth through its General Plan process, Countywide Transportation Plan, and establishment of growth limit lines. Since the construction of this interchange, the county has subsequently experienced substantial residential and economic growth along both the I-680 and SR-4 corridors. These highways serve residents and workers who are traveling increased distances between their homes and jobs, both within the county and from more distant regional areas. The existing configuration of the interchange cannot adequately handle current or future projected traffic volumes or patterns, resulting in

substantial congestion and travel delays and contributing to safety problems, as discussed below.

1.2.2.1 Capacity Constraints

The existing cloverleaf design of the interchange is a capacity constraint to both I-680 and SR-4. The loop ramps have a tight radius, which limits travel speed. The distances between the on-ramps and off-ramps in each direction are relatively short, which limits the distance in which exiting and entering vehicles can merge or "weave" and causes backups that extend onto the freeway ramps during peak periods. The traffic at these points can back up and contribute to congestion on the freeway mainlines. This is one of the primary causes of congestion at this location for both I-680 and SR-4, and the resulting congestion limits the traffic volume that can pass through the interchange. A contributing operational deficiency on SR-4 is the close spacing of the Pacheco Boulevard on- and off-ramps, which are just to the west of the I-680 on- and off-ramps. Thus, within a short distance along SR-4, drivers must contend with congestion and merging actions at the loop on- and off-ramps with I-680, the I-680 diagonal on- and off-ramps, and the Pacheco Boulevard hook on- and off-ramps.

1.2.2.2 Local Circulation and Freeway Access

Pacheco Boulevard is a primary north-south arterial that links Martinez to the north with Pleasant Hill and Concord to the south. (Pacheco Boulevard becomes Contra Costa Boulevard south of Concord Avenue.) Short hook ramps connect Pacheco Boulevard to SR-4 just west of I-680 and Muir Road. Pacheco Boulevard and Contra Costa Boulevard provide access to both residential and commercial uses. The hook ramp connections between SR-4 and Pacheco Boulevard provide the only regional freeway access between Contra Costa Boulevard and Arthur Road, which are about 4 kilometers (km) (2.5 miles) apart. The ramp connections also provide important access to commercial vehicles that would otherwise have to use routes through residential areas that have steep grades, impacting local roadway operation.

1.2.2.3 Traffic Volumes

In 2002, total mainline traffic volumes on I-680 within the project limits were approximately 109,000 vehicles per day north of the interchange and 133,000 vehicles per day south of the interchange.[2] On SR-4, the volumes were 86,000 west of the interchange and 81,000 east of the interchange. Within the interchange, some

[2] These are the total volumes (both directions) as listed in the 2002 Traffic Volumes on the California Highway System Web site.

ramps are carrying traffic volumes and experiencing operational deficiencies that result in points of congestion. As noted in Section 1.2.2.1, traffic entering and exiting the interchange ramps must merge or weave with the highway mainline traffic, which constrains the level of service (LOS). LOS is a measure of traffic flow that indicates how well a roadway or intersection is operating, based on the available capacity and the volume of predicted traffic. LOS is expressed using the letters A (representing the best conditions, with unrestricted or relatively free-flow traffic) through F (representing the worst conditions, with stop-and-go congestion and/or breakdown of traffic flow). Evaluation of weaving within the existing interchange showed that all but two of the weaving sections studied function at LOS F during both the morning and afternoon peak periods.

By the year 2030, peak hour demand will exceed mainline capacity on westbound SR-4 and southbound I-680 in the morning peak hour, and on northbound I-680 in the evening peak hour. In particular, northbound I-680 to westbound SR-4 and eastbound SR-4 to southbound I-680 will be limited by bottlenecks that will constrain flow through these directional movements. Appendix I includes line diagrams that show freeway peak hour volumes and lane configurations for the interchange and connecting roadways.

1.2.3 Safety Concerns

The short weaving distances between the on- and off-ramps in each direction are the primary location of accidents within the interchange. Evaluation of Traffic Accident Surveillance and Analysis System (TASAS) data for the project's Draft Project Report (Caltrans 2004) for the period July 2000 to June 2003 (for the SR-4 segment within the project limits) and October 2000 to September 2003 (for the I-680 segment) indicates that accidents take place at similar-to-average rates for similar facilities (i.e., cloverleaf interchanges) for the overall project limits, and some conditions within the project limits are above statewide averages. The proposed phases address many of the interchange's deficiencies and improve both safety and operational characteristics. Areas of concern within the existing facility include the following:

- Eastbound SR-4:
  - Vicinity of the lane drop west of the Pacheco Boulevard exit ramp
  - Weave section between the Pacheco Boulevard on-ramp and SR-4 to the southbound I-680 slip ramp

  - Weave section between loop on- and off-ramps to and from I-680

- Westbound SR-4:
  - Weave section between the loop on- and off-ramps to and from I-680
  - Weave section between the I-680 slip on-ramp and the Pacheco Boulevard off-ramp

- Northbound I-680: Weave section between the loop on- and off-ramps to and from SR-4

- Southbound I-680:
  - Weave section between the loop on- and off-ramps to and from SR-4
  - Exit ramp to Concord Avenue interchange

- Loop Ramps: Northbound I-680 to westbound SR-4

1.3 Viable Alternatives

1.3.1 Alternative D2A

During preparation of the PSR, Alternative D2A was selected for further study. All other alternatives identified in the PSR were eliminated from further consideration (see Section 1.5). Alternative D2A is referred to herein as the proposed project.

Additional improvements have been added to the project since the completion of the PSR. These proposed improvements include features designed to improve the geometric layout of the interchange and accommodate future traffic flow. The improvements primarily affect Phase 5, although other refinements have been included in all phases of the project, described in Section 1.1.3.

The following subsections describe other components of the project phases, including the proposed slip ramps, the proposed work at the Contra Costa Canal crossings, soundwalls, and project funding and schedule.

1.3.1.1 Slip Ramps

The term slip ramp refers to local access entry or exit ramps that connect with freeway-to-freeway direct connector ramps. If approved, slip ramps could be included in Phases 1 and 2 to connect I-680 with Pacheco Boulevard. Section 1.3.1.3 describes Phases 1 and 2 of the project with and without slip ramps.

1.3.1.2 Approval Required for Change in Freeway Access Design

Access to the national freeway system (e.g., onto I-680) is carefully controlled for many reasons, among them to maintain integrity of the system, uniformity of design, and safety. Phases 1 and 2, with or without slip ramps, would change existing access to and from I-680. FHWA retains the approval rights to any request to access or modify an existing access to the national freeway system. Following review of the project, FHWA granted conceptual approval of the slip ramps in November 2005 (FHWA 2005). If no changes are made to the proposed alternatives and no major changes are made to the proposed design, FHWA would issue final approval of the slip ramps upon completion of the environmental review process.

1.3.1.3 Proposed Freeway Access Change

Northbound I-680 to Westbound SR-4

Currently, vehicles traveling northbound on I-680 exit the freeway on a short-radius loop ramp to connect to westbound SR-4, travel a short distance on SR-4 through a merge area for southbound I-680 to westbound SR-4 traffic, and then exit SR-4 on a short-radius hook ramp that connects to Pacheco Boulevard.[3] Phase 1 would add a direct-connector flyover ramp for the I-680 northbound to SR-4 westbound movement, allowing removal of the existing loop ramp. Removal of this loop ramp eliminates one point of congestion and weaving caused by slow-moving vehicles exiting I-680 and entering SR-4 in relatively close proximity to the westbound SR-4 to southbound I-680 off-ramp, the southbound I-680 to westbound SR-4 on-ramp, and the westbound SR-4 to Pacheco Boulevard off-ramp. Removal of this loop ramp is consistent with the purpose and need of the project in that it eliminates two weaving sections at this interchange, one from westbound SR-4 and one from northbound I-680.

The proposed direct-connector flyover would allow drivers to take a relatively high-speed ramp connection from northbound I-680 to westbound SR-4, avoiding the existing short-radius loop ramp connection with the exiting and entering merging areas on SR-4. The proposed direct connector meets the purpose and need of the project by reducing congestion and subsequently improving the operational efficiency of the interchange. The direct connector is also intended to accommodate anticipated traffic growth in future years.

[3] The existing ramps and connections can be seen in the background of the aerial photos included in Appendix A. Specifically, Figures A-i, A-ii, A-3, and A-4 show the I-680/SR-4 and the SR-4/Pacheco Boulevard interchange ramps discussed in this section.

The approved slip ramp design, connecting the proposed Phase 1 freeway-to-freeway direct connector ramps to Pacheco Boulevard, helps maintain an important access point to and from the freeway system at this interchange. The proposed slip ramp from the northbound I-680 to SR-4 connector to Pacheco Boulevard would address the purpose of providing freeway access to Pacheco Boulevard at this location. This slip ramp would enable travelers on northbound I-680 to first exit I-680 on the proposed direct-connector ramp to westbound SR-4, continue approximately 800 meters to 1 km (0.5 to 0.6 mile) to the north, and then exit the freeway on the slip ramp to Pacheco Boulevard. The slip ramp would provide a freeway connection to Pacheco Boulevard via the northbound I-680 to westbound SR-4 ramp, a connection that would be otherwise eliminated from the interchange due to the removal of the loop ramp. The slip ramp connection is consistent with the purpose and need objective of providing access between I-680 and Pacheco Boulevard.

Without the slip ramps, travelers on northbound I-680 would have less efficient options for exiting the freeway system to access businesses or homes on Pacheco Boulevard, Muir Road, or Arnold Drive in the immediate vicinity of the interchange. They would have to (1) use the I-680/Concord Avenue interchange to the south and then drive north on Pacheco Boulevard; (2) take the SR-4/Morello Avenue interchange to the west and use Arnold Drive or Muir Road; or (3) use the Pacheco Boulevard/I-680 interchange north of the project area and travel south on Pacheco Boulevard. Those benefiting from the proposed slip ramp connections would include residents and businesses located near the existing I-680/SR-4 and I-680/Pacheco Boulevard interchanges, as well as the California Highway Patrol (CHP) and the Contra Costa County Sheriff. The CHP has an office on Blum Road just north of the interchange, and the Sheriff has an office on Muir Road west of the interchange. Both law enforcement offices use the existing ramps from Pacheco Boulevard and Muir Road to access SR-4 and I-680. Letters submitted by the CHP and Sheriff (included in Appendix H) state that maintaining access to and from Pacheco Boulevard would prevent an increase in emergency response time and a potential increase in traffic conflicts during emergencies due to the additional travel required to reach alternate freeway interchanges at Concord Avenue and Morello Avenue.

The slip ramp would introduce a new exit from the freeway system along a freeway-to-freeway connector, which is intended to function as a relatively high-speed facility. FHWA policy calls for freeway facilities to conform to established design standards that maximize safety and maintain the uniformity in the freeway system. Including slip ramps therefore requires approval from FHWA as an exception to national

policy. As stated in Section 1.3.1.2, FHWA has reviewed and granted conceptual approval of this slip ramp in November 2005 (FHWA 2005).

Eastbound SR-4 to Southbound I-680

The current interchange has a single-lane diagonal connector ramp between eastbound SR-4 and southbound I-680. On- and off-ramps for eastbound SR-4 to Muir Road are located immediately preceding the diagonal connector, requiring travelers exiting to the eastbound SR-4 to southbound I-680 ramp to first pass through traffic exiting and entering Muir Road. This area of weaving is one point of congestion for the existing interchange.

Phase 2 would replace the existing diagonal connector ramp between eastbound SR-4 and southbound I-680 with a high-speed freeway-to-freeway direct-connector ramp. The exit point from SR-4 to this ramp would be west of and separate from the existing Muir Road ramps to reduce the overlapping merging and weaving that takes place at this location. This design would improve the traffic flow on SR-4 as well as help to maintain the speed of traffic heading onto the new connector ramp to southbound I-680.

The proposed slip ramp from Pacheco Boulevard to southbound I-680 would connect approximately midway along the new eastbound SR-4 to southbound I-680 direct connector. The slip ramp would provide access to I-680, similar to the access provided by the combination of the Pacheco Boulevard to eastbound SR-4 on-ramp and eastbound SR-4 to southbound I-680 ramp connections. This slip ramp had the potential to introduce a merging area that could increase unwanted congestion or conflicts midway along a connector ramp that is intended to maintain freeway-level speeds. To minimize this potential conflict, the length of the slip ramp from Pacheco Boulevard to the connector ramp was designed to allow maximum time for drivers to accelerate as they approach the merge area on the connector. The intersection of the proposed slip ramp at Pacheco Boulevard would also be signalized, which if necessary can be timed to control or meter groups of vehicles entering the freeway. FHWA granted conceptual approval of this slip ramp in November 2005 (FHWA 2005).

Without the proposed slip ramp, drivers would have to use the next-nearest entrance to the freeway system at either Concord Avenue on I-680, Morello Avenue on SR-4, or the I-680/Pacheco Boulevard ramps north of the project area. Officers traveling from the CHP station on Blum Road or the Sheriff's office on Muir Road could still

access eastbound SR-4, but entering southbound I-680 would require taking Pacheco Boulevard south to the Concord Avenue/I-680 southbound on-ramp, which would add unwanted additional response time.

1.3.1.4 Contra Costa Canal Crossing

The SR-4/Contra Costa Canal crossing is located approximately 225 meters (740 feet) from the SR-4/Pacheco Boulevard crossing. The existing canal crosses under SR-4, the Pacheco Boulevard to westbound SR-4 on-ramp, the eastbound SR-4 to Pacheco Boulevard off-ramp, and Muir Road through a box culvert siphon structure. The SR-4/Contra Costa Canal crossing includes the placement of bridge abutments for the Phase 1 and Phase 2 structures. The PSR and Advanced Planning Studies[4] indicate that the proposed bridge abutments may conflict with the Contra Costa Canal siphon. It was determined in the Project Report phase that either the Contra Costa Canal siphon/culvert structure would need to be slightly relocated or bridge abutments would need to be relocated to resolve the conflict. The selection of the accommodating procedure will be completed during the design of the project in the PS&E stage.

1.3.1.5 Soundwalls and Aesthetic Design of Structures

Within the project limits, I-680 has existing soundwalls and SR-4 has one existing soundwall. Additional soundwalls are included in a separate project to add HOV lanes on I-680. Soundwalls included in the I-680/SR-4 interchange improvements are discussed in Section 2.4. Soundwall locations evaluated for the I-680/SR-4 interchange project are shown in Appendix A, Figures A-1 through A-13.

The design and aesthetic treatment of the overhead freeway structure (including the flyover and its ramps, columns, walls, etc.) shall be determined with input from public outreach meeting(s) to be held during the design phase of the project. New soundwalls would be similar in design and aesthetic treatment to adjacent existing soundwalls to be visually consistent within the I-680/SR-4 freeway corridor

1.3.1.6 Project Funding and Schedule

Phases 1 through 5 are included in MTC's long-range *Transportation 2030 Plan* (MTC 2005). The plan anticipates that Phases 1 and 2 will be operational by 2015

[4] The PSR is an engineering report that documents agreement on scope, schedule, and estimated cost for advancement of a project concept for future funding and design studies. Advanced Planning Studies are structural engineering reports that are completed in early project development or design stages to determine whether any roadway structures or features involved in the project need to be rehabilitated or upgraded as part of the project.

and Phases 3, 4, and 5 will be operational by 2025. An amendment to the MTC Transportation Improvement Program (TIP) will include Phases 1 and 2 for initial funding in the 2008 fiscal year.

The voters of Contra Costa County approved Measure C in 1988 to provide funding for transportation improvements, and CCTA is responsible for distributing Measure C funds for proposed projects. Although funding for Phases 3 through 5 has not been identified, Measure C funds are a possible source of temporary or permanent funding. The CCTA 2002 Strategic Plan states that although construction funds have not been identified for improvements to the I-680/SR-4 interchange, the CCTA wishes to ensure that the project development activities continue. Therefore, $1.244 million (in 1998 dollars) has been allocated for project development through the environmental document stage. Amendment No. 4 of the Strategic Plan, dated December 4, 2003, has scheduled the project into its Program of Projects and has allocated approximately $764,000 to the project for fiscal year 2004. CCTA also applied for $5.5 million in additional funding for the PS&E for the 2004/2005 program year in the 2002 State Transportation Improvement Program and will look to future State Transportation Improvement Programs for construction implementation, as funding is available.

The following lists the major schedule steps for the project.

Milestone	Date
Phases 1 and 2:	
Approve PSR	November 2001
Project Approval and Environmental Document	October 2006
Right-of-Way Certification	October 2012
Ready to List	October 2012
Approve Contract	November 2012
Job Completion	June 2014
Phase 3 Completion	2020
Phase 4 Completion	2020
Phase 5 Completion	2020

A schedule for Phases 3 through 5 has not been formulated, but these phases are generally anticipated to be completed by 2020, as funding is obtained.

Preliminary cost estimates for the proposed phases are as follows.

	With Slip Ramps	Without Slip Ramps
Phase 1:		
Roadway Items:	$28,309,000	$25,861,000
Structure Items:	$27,563,000	$20,413,000
Right of Way Items:	$ 2,803,000	$ 2,258,000
Phase 1 Cost:	$58,675,000	$48,352,000
Phase 2:		
Roadway Items:	$22,136,000	$20,566,000
Structure Items:	$12,162,000	$12,162,000
Right of Way Items:	$ 1,563,000	$ 1,544,000
Phase 2 Cost:	$35,861,000	$34,272,000
Phase 3:		
Roadway Items:	$25,368,000	
Structure Items:	$ 9,982,000	
Right of Way Items:	$ 13,000	
Phase 3 Cost:	$35,363,000	
Phase 4:		
Roadway Items:	$17,696,000	
Structure Items:	$16,309,000	
Right of Way Items:	$ 672,000	
Phase 4 Cost:	$34,677,000	
Phase 5:		
Roadway Items:	$24,483,000	
Structure Items:	$ 4,507,000	
Right of Way Items:	$ 175,000	
Phase 5 Cost:	$28,990,000	

Total Project Cost With Slip Ramps (Phases 1–5):	$193,379,000
Total Project Cost With No Slip Ramps (Phases 1–5):	$181,467,000

1.3.2 No Action Alternative

The No Action Alternative would make no improvements to the interchange. The existing constraints described in Section 1.2 would continue, but traffic conditions are expected to worsen over time as the number of drivers using the facility increases due to local and regional growth. Projected traffic growth for the year 2030 based on Association of Bay Area Governments (ABAG) regional population and economic estimates will result in freeway volumes that approach or exceed capacity at several locations in the interchange vicinity: southbound I-680 just south of SR-4 (AM), westbound SR-4 just east of I-680 (AM), northbound 1-680 just south of SR-4 (PM),

and eastbound SR-4 just east of I-680 (PM). A number of freeway facilities or segments would also experience continued impacts, and levels of service would deteriorate due to constrained areas of weaving and merging.

The No Action Alternative would have none of the impacts that have been identified for the various phases, although all of these impacts can be mitigated as described in Section 2. The soundwalls identified in this report would not be constructed under the No Action Alternative, which would leave some homes exposed to noise levels that exceed noise abatement and local noise standards.

1.4 Alternatives Considered and Withdrawn

The I-680/SR-4 interchange has long been identified as needing operational and capacity improvements. Since the interchange was constructed in the early 1960s, traffic patterns have substantially changed in central and eastern Contra Costa County.

In 1983, the Contra Costa County Board of Supervisors requested planning for reconstruction of the existing cloverleaf interchange, following the upgrading of SR-4 from a conventional highway to freeway standards, but plans were not implemented. In 1993, Caltrans prepared a PSR/Project Report for the purpose of protecting right-of-way in the vicinity of the interchange from future encroachment and to encourage compatible land uses. The PSR/Project Report considered a single concept for an ultimate four-level freeway-to-freeway interchange.

In January 2000, engineering studies were started to investigate potential improvements to the interchange, including both near-term and long-term or "ultimate" improvements, and to examine what improvements should be incorporated into the I-680 HOV Lane Project design to ensure compatibility with future improvements.

A Project Development Team was assembled consisting primarily of participants from CCTA, Caltrans, the FHWA, and Contra Costa County. Coordination and presentations by PDT members were made periodically to local cities, the Pacheco Municipal Advisory Committee, and the Transportation Partnership and Coordination – Central County (TRANSPAC) (the regional transportation planning committee for central Contra Costa County). The role of the PDT was to provide direction in the development of alternative concepts, evaluation of the alternatives,

and recommendations for project implementation while gaining feedback and input from the interested cities and committees.

During the Conceptual Engineering Studies phase, a broad range of 17 alternative concepts were developed for both short-term operational improvements and long-term ultimate improvements. They were grouped into six categories: Near-Term Improvement Alternatives, Pacheco Interchange Improvement Alternatives, SR-4 CD Road Alternatives, 3-Level Interchange Alternatives, HOV Connection Alternatives, and 4-Level Interchange Alternatives. With the exception of three long-term alternative concepts and two short-term alternatives, all other concepts were dropped from consideration for not meeting the project purpose and need in terms of traffic operations or maintaining local access; not proving to be cost effective; or for not meeting an acceptable geometric standard for freeway-to-freeway interchange design.

The remaining five alternatives under consideration were subsequently evaluated according to 30 criteria grouped into seven categories. The categories were Purpose and Need, Geometric Considerations, Traffic Operations, Constructability, Environmental, Right-of-Way, and Costs and Benefits.

In June 2000, Caltrans representatives met with FHWA to discuss the five interchange alternatives under consideration, prior to presentation of the alternatives evaluation results to the PDT. Support was expressed for the Long-Term Conceptual Alternative D2A, the currently proposed Phases 1 through 5.

In July 2000, project representatives made presentations to senior staff of the Pacheco Municipal Advisory Committee to update them on the alternative concepts being considered. The committee expressed support for Conceptual Alternative D2A because it was the only alternative that would maintain all current traffic movements without out-of-direction travel.

At the completion of the conceptual studies and distribution of the Draft Conceptual Engineering Report, the PDT requested that senior staff members at TRANSPAC be contacted and the findings of the team be shared. In September 2000, a presentation was made to TRANSPAC of the findings. Following the presentation, TRANSPAC submitted a letter of concurrence expressing support for Alternative D2A.

In 2003 and 2004, during geometric review of the Draft Project Report for the interchange phases, several additional options were developed for some of the connector ramps (northbound I-680 to eastbound SR-4 and westbound SR-4 to

southbound I-680). Two identified options would provide improvements and were confirmed and included in the project phases. These improvements were reconstruction of the northbound I-680 to eastbound SR-4 diagonal ramp into a two-lane ramp with improved curvature and sight distance, and inclusion of the westbound SR-4 to southbound I-680 two-lane loop ramp. Other ramp variations were considered but dropped. These rejected options included the following:

- Adding a lane to the existing northbound I-680 to eastbound SR-4 diagonal ramp. This option was rejected in favor of rebuilding/realigning this ramp to improve the curvature and sight distance while still providing an additional lane.
- Combining the northbound I-680 exit ramps (as proposed, there will be a northbound I-680 exit ramp for the flyover to eastbound SR-4 in Phase 1, followed by a northbound I-680 to eastbound SR-4 at-grade two-lane ramp in Phase 5). The rejected option considered having both northbound I-680 to eastbound SR-4 and northbound I-680 to westbound SR-4 traffic on one ramp exiting I-680, and just north of the I-680 exit this ramp option would divide into westbound and eastbound SR-4 traffic directions. This option was rejected in favor of the proposed separate I-680 exits for each of the northbound I-680 to westbound and eastbound SR-4 movements to avoid combining different directional movements within a single exit ramp.
- An option to provide a westbound SR-4 to southbound I-680 two-lane connector ramp was evaluated and rejected as it would require a fourth-level flyover ramp structure at a relatively high cost. This option would partially duplicate the regional traffic movement already served by westbound SR-4 to SR-242. The proposed five-phase I-680/SR-4 interchange design would not preclude adding such an option in the future, as a separate project, if required due to high traffic volume growth in the region.

To address the FHWA requirement to support the proposed use of slip ramps to provide access to I-680 (see Section 1.3.1), a review was performed of possible options to improve the next-nearest existing interchange access points on I-680 and SR-4. This review focused on the existing interchanges at I-680 and Concord Avenue and at SR-4 and Morello Avenue. Twenty-two potential improvements were identified and evaluated for their relative performance, right-of-way requirements, bicycle and pedestrian facility conflicts or requirements, and estimated cost. These options are listed and summarized in Table 1-1 and shown in Figure 1-7.

Table 1-1 Summary of Local Roadway and Intersection Improvement Options Considered

Option	Location	Description	Advantages	Disadvantages	Right-of-Way Impacts	Bike / Pedestrian	Cost
Pacheco Boulevard/Contra Costa Boulevard/Chilpancingo Parkway/Concord Avenue Intersection							
Option 1	WB Concord Ave.	Add a right-turn lane and columns (existing could become a thru lane or remain as right-turn lane)	Adds capacity to intersection, funnels traffic to SB I-680 from Concord Ave.	Right-turn geometry is constrained by right-of-way (most likely nonstandard design); turning radius may limit truck traffic	None	No existing sidewalk/bike path, no proposed sidewalk or bike path.	$1.0 Million
Option 2	WB Concord Ave.	Add a through and left-turn lane on WB approach at intersection	Adds additional capacity to intersection	Limited width under the structure requires realignment of lanes	Requires acquisition of right-of-way from gas station and others	Bike lane on Chilpancingo Pkwy. is to remain. Contra Costa Blvd. could become less pedestrian friendly due to limited right-of-way.	$2.1 Million
Option 3	SB Pacheco Blvd.	Add exclusive right-turn lane	Frees vehicles from queue backup at intersection, could shorten green-time for SB Pacheco Blvd.	Require right-of-way acquisition from shopping center, loss of parking or landscaping; construction would likely affect business	Requires acquisition of right-of-way from Pleasant Hill Shopping Center, will result in loss of parking and landscaping for shopping center.	Potential to lose sidewalk due to limited right-of-way and the need to preserve parking.	$2.7 Million
Option 4	SB Pacheco Blvd.	Add third left-turn lane	Allows for additional capacity for the left-turn, free SB lanes from the backup of the left-turn queue	Limited right-of-way and lane configuration constraints limit the feasibility of this option without acquiring right-of-way from Shopping Center	Right-of-way is needed from Shopping Center	Potential to lose sidewalk due to limited right-of-way and the need to preserve parking.	$2.7 Million
Option 5	NB Contra Costa Blvd.	Add a NB lane both north and south of the intersection	Adds capacity to NB and intersection	Limited right-of-way on east side of Contra Costa Blvd.	Requires acquisition of right-of-way on east side of Contra Costa Blvd.	Existing sidewalk on Contra Costa Blvd. would need to be replaced.	$1.2 Million
Option 6	EB Chilpancingo Pkwy.	Add exclusive right-turn lane	Vehicles turning right will avoid backup at intersection, and queuing is reduced	Limited right-of-way; acquisition of right-of-way would be required from adjacent businesses. Contra Costa Canal culvert would need to be widened.	Requires acquisition of right-of-way from gas station and others	Existing sidewalk on Chilpancingo Pkwy. would need to be replaced.	$0.6 Million

Table 1-1 Summary of Local Roadway and Intersection Improvement Options Considered

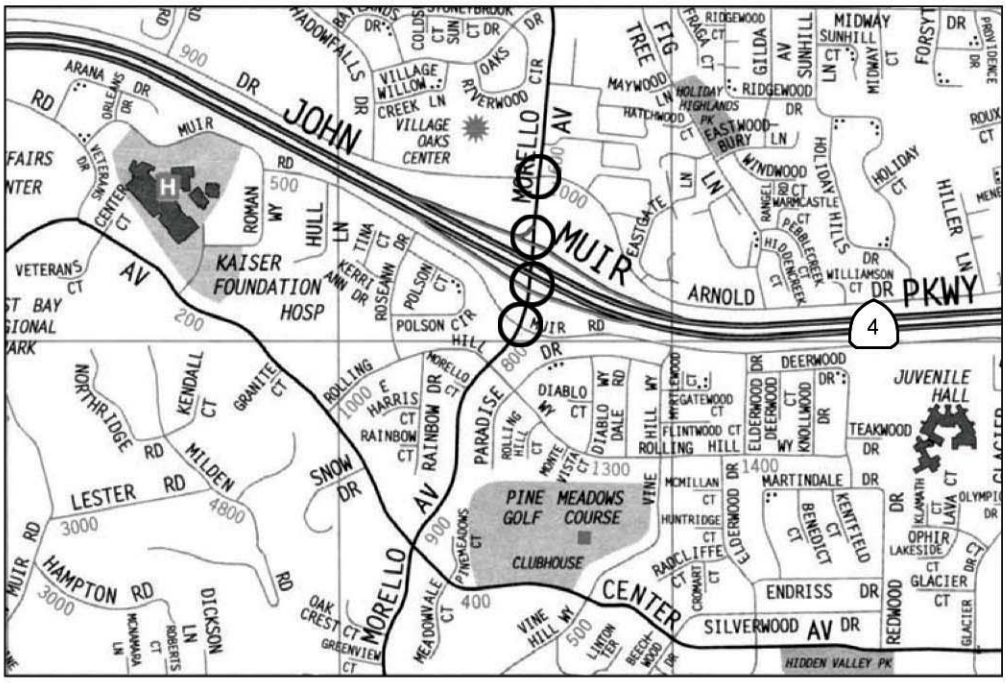
Option	Location	Description	Advantages	Disadvantages	Right-of-Way Impacts	Bike / Pedestrian	Cost
Pacheco Boulevard/SB I-680 Off-Ramp/Pleasant Hill Shopping Center							
Option 7	SB Pacheco Blvd.	Add exclusive right-turn lane into shopping center	Allows greater flow of traffic SB, easier access to shopping center	Requires right-of-way acquisition from shopping center, loss of parking and landscaping and disruption to shopping center during construction.	Requires acquisition of right-of-way from Pleasant Hill Shopping Center, will result in loss of parking and landscaping for shopping center.	Potential to lose sidewalk due to limited right-of-way and the need to preserve parking.	$1.3 Million
Option 8	SB Pacheco Blvd.	Add second left-turn pocket lane	Increases capacity of left turn; will improve the flow of traffic to SB I-680 and SB Pacheco Blvd.	Limited right-of-way makes alternative difficult. Requires right-of-way acquisition from shopping center.	Requires acquisition of right-of-way from Pleasant Hill Shopping Center, will result in loss of parking and landscaping for shopping center.	Potential to lose sidewalk due to limited right-of-way and the need to preserve parking.	$1.3 Million
Option 9	NB Pacheco Blvd.	Extend left-turn lane into shopping center	Added queuing will help NB traffic flow, and avoid backup of queue into NB Pacheco Blvd. Provides better access to shopping center.	Right-of-way is severely limited; would require acquisition of right-of-way of shopping center.	Requires acquisition of right-of-way from Pleasant Hill Shopping Center, will result in loss of parking and landscaping for shopping center.	Potential to lose sidewalk due to limited right-of-way and the need to preserve parking.	$1.1 Million
Option 10	NB Pacheco Blvd.	Eliminate left-turn lane.	Allows for higher NB flow of traffic. Other access into shopping center exists from all directions.	Loss of access to shopping center, could affect businesses.	None	No loss of existing sidewalk.	$0.4 Million
Option 11	WB approach from I-680	Add third left-turn lane	Allows for greater capacity at intersection	Requires additional right-of-way to the south; shopping center would be affected; may require modifications to the off-ramp; tight right-turn radius.	Requires Acquisition of right-of-way south of Pleasant Hill Shopping Center	No loss of existing sidewalk.	$0.7 Million

Table 1-1 Summary of Local Roadway and Intersection Improvement Options Considered

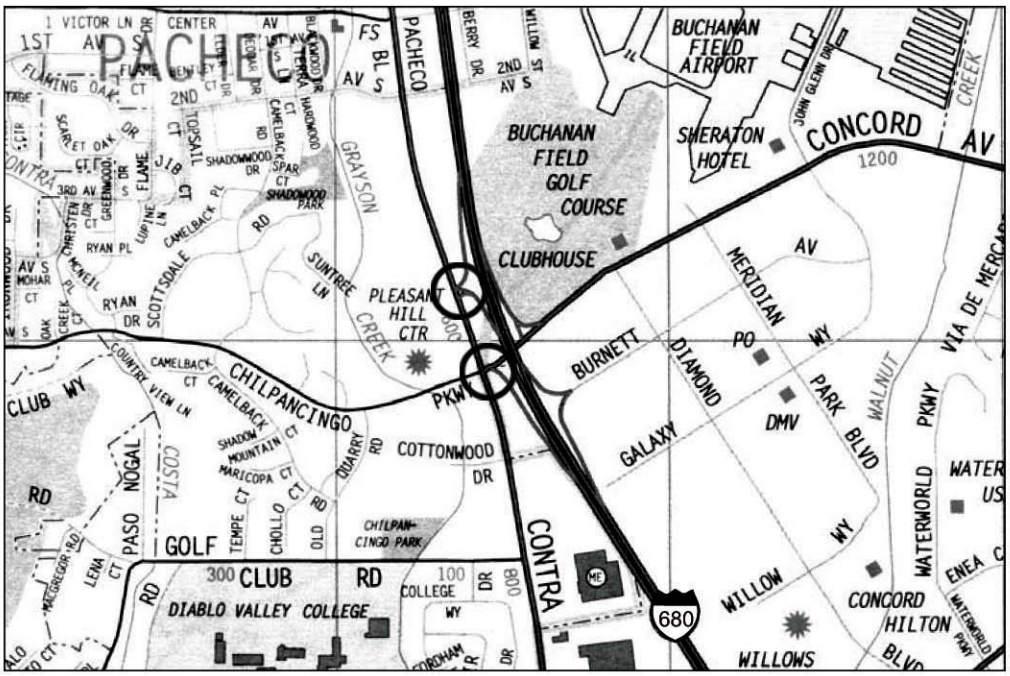
Option	Location	Description	Advantages	Disadvantages	Right-of-Way Impacts	Bike / Pedestrian	Cost
Option 12	Eastbound approach (exit from shopping center)	Add exclusive right-turn lane	Reduces queue and green-time for shopping center, increased green-time for Pacheco Blvd.	Loss of parking and landscaping at shopping center	Shopping center exit would be widened, affecting the shopping center.	Potential loss of sidewalk and landscaping in shopping center parking lot.	$0.9 Million
Morello Avenue/SR 4 Interchange							
Option 13	WB SR 4 off-ramp to Morello Ave.	Add exclusive left-turn lane, in addition to the combined left and through lane	Adds capacity to intersection	Affects landscaped area, retaining wall; utility relocation needed.	None	No existing bike lanes; sidewalks on Morello Ave will remain	$1.4 Million
Option 14	Morello Ave. to EB SR-4 (southbound approach)	Add third left-turn lane to EB SR 4	Adds capacity to intersection	Requires widening on ramp to accommodate 3 lanes, additional right-of-way may be needed. Retaining wall needed on Morello Ave under structure.	Additional right-of-way may be need for third lane on Morello Ave. to EB SR-4 on-ramp.	Existing bike lane and sidewalk on Morello Ave will need to be replaced.	$1.1 Million
Option 15	Morello Ave. to EB SR-4 (northbound approach)	Add exclusive right-turn lane	Adds capacity to intersection	Requires additional right-of-way	Additional right-of-way is needed on Morello Ave.; this could affect the Chevron gas station on Morello Ave.	Potential to loose sidewalk due to limited right-of-way and the need to preserve parking.	$1.3 Million
Morello Avenue/Muir Road							
Option 16	Southbound Morello Ave. approach	Add exclusive right-turn lane	Adds capacity to intersection	Requires additional right-of-way, retaining wall and utility relocation	Additional right-of-way is needed on Morello Ave. and Muir Road	Bike lane and sidewalk on Morello Ave. could be affected due to limited right-of-way on Morello Ave. and Muir Road.	$1.3 Million
Option 17	Southbound Morello Ave. approach	Add second left-turn lane	Adds capacity to intersection	Requires additional right-of-way	Additional right-of-way is needed on Muir Road for lane drop.	Sidewalk on Muir Road could be affected due to limited right-of-way.	$1.3 Million
Option 18	Northbound Morello Ave. approach	Add exclusive right-turn lane	Adds capacity to intersection	Requires additional right-of-way	Additional right-of-way is needed on Morello Ave. and Muir Road	Sidewalk on Muir Road could be affected due to limited right-of-way.	$0.8 Million

Table 1-1 Summary of Local Roadway and Intersection Improvement Options Considered

Option	Location	Description	Advantages	Disadvantages	Right-of-Way Impacts	Bike / Pedestrian	Cost
Option 19	Northbound Morello Ave. approach	Add second left-turn lane	Adds capacity to intersection	Requires additional right-of-way	Additional right-of-way is needed on Morello Ave. and Muir Road	Bike lane and sidewalk on Morello Ave. could be affected due to limited right-of-way on Morello Ave. and Muir Road.	$1.4 Million
Morello Avenue/Arnold Drive							
Option 20	Southbound Morello Ave. approach	Add exclusive right-turn lane	Adds capacity to intersection	Requires additional right-of-way, retaining wall and utility/signal relocation	Additional right-of-way is needed on Morello Ave. and Arnold Dr.	Bike lane and sidewalk on Morello Ave. could be affected due to limited right-of-way	$1.5 Million
Option 21	Southbound Morello Ave. approach	Add second left-turn lane	Adds capacity to intersection	Requires additional right-of-way, retaining wall and utility/signal relocation	Additional right-of-way is needed on Morello Ave. and Arnold Dr.	Bike lane and sidewalk on Morello Ave. could be affected due to limited right-of-way	$2.2 Million
Option 22	Northbound Morello Ave. approach	Add exclusive right-turn lane	Adds capacity to intersection	Requires additional right-of-way	Additional right-of-way is needed on Morello Ave. and Arnold Dr.	Bike lane and sidewalk on Morello Ave. could be affected due to limited right-of-way	$1.4 Million



SR4/Morello Avenue Interchange



I-680/Concord Avenue Interchange

○ Local intersection/interchange access evaluated for potential improvement

0 0.5 mile

Source: Thomas Guide, Metropolitan Bay Area, 2001

URS	Project No. 26812933 I-680/SR-4	INTERCHANGE IMPROVEMENTS EVALUATED AT CONCORD AVENUE/I-680 AND MORELLO AVENUE/SR-4	Figure 1-7

Individually, the options provide a range of potential benefits but are not sufficient to address the purpose and need discussed in Section 1.2. Logical combinations of some of the options can provide promising local benefits. However, several conclusions were reached that ultimately eliminated these options from further consideration as alternatives to this project. At a local level (in the vicinity of the potential improvement options), the benefits would be incremental; however, even considered cumulatively, these options would not solve the long-term need to better accommodate traffic at Concord Avenue and Pacheco Boulevard. The existing split-interchange configuration, the cost to construct the improvements, and the potential adverse affects from acquisition of businesses and land make these options disruptive, difficult to build, and costly. In addition, the options would not substantially improve access to SR-4 at Pacheco Boulevard or Muir Road. Travelers would have to use the Concord Avenue interchange to access I-680 and the Morello Avenue interchange to access SR-4, which requires a longer travel distance for trips originating or ending at Pacheco Boulevard or Blum Road in the vicinity of the I-680/SR-4 interchange. For these reasons, the options listed in Table 1-1 were not advanced for further consideration because even cumulatively they would not sufficiently fulfill the project purpose identified in Section 1.2.1.

Additional review was also performed to examine any other alternatives to the proposed slip ramps connecting to Pacheco Boulevard (see Section 1.3.1). The review resulted in the development of six options that were considered by the PDT, but these options were also not recommended for further development or study. The options identified included the construction of a tunnel under the I-680/SR-4 interchange and design variations of connections to Pacheco Boulevard or Muir Road. It was concluded that none of the designs analyzed sufficiently improved upon the proposed slip ramps. Two options that would combine the I-680 northbound to eastbound and westbound SR-4 exit ramps could degrade traffic operations on I-680 to LOS F at the ramp, which could cause backups onto I-680 and potentially negate the traffic flow improvements provided by the proposed Phase 1 high-speed direct connector. Almost all of the options required additional project costs and right-of-way, with associated impacts to adjacent local land uses (e.g., access changes and acquisition of shopping center parking) and to bike lanes and pedestrian facilities.

1.5 Related Transportation Projects

Other major transportation projects in the vicinity of the I-680/SR-4 interchange are described below.

I-680 HOV Lanes. The I-680 HOV Lane Project will be completed in late 2005, adding a new HOV lane in the northbound direction of I-680 between SR-242 and the Marina Vista interchange in Martinez and in the southbound direction between North Main Street overcrossing in Walnut Creek and Marina Vista. The new lanes are designated for HOV vehicle use. These lanes will also link to the new HOV lanes on the new Benicia-Martinez Bridge, described below.

Second Benicia-Martinez Bridge. A second Benicia-Martinez Bridge is under construction that will be parallel to the existing railroad and highway bridges. This new structure will increase the number of lanes to eight (four lanes eastbound on the new bridge and four lanes westbound on the existing bridge). Provisions will be made for HOV bypass lanes at the toll plaza. The construction for this bridge has been delayed but is expected to be completed in 2007.

Burlington Northern–Santa Fe Railroad Crossing. The Burlington Northern–Santa Fe (BNSF) railroad crosses I-680 south of the Pacheco Boulevard connection ramps with I-680. The initial plans and environmental clearance for the I-680 HOV lanes included reconstruction of the BNSF structure over I-680. However, it was determined during final design of the HOV lanes that reconstruction of the structure was not necessary to construct as part of that freeway widening improvement, and it was separated out as an individual project to be built at a later time. Phase 5 of the interchange project would be completed after the BNSF crossing is constructed, as that phase extends the northbound widening on I-680 to just north of (and through) the BNSF crossing structure.

Local Road Improvements. The CCTA 2004 Countywide Transportation Plan Update includes two nearby projects: widening of Pacheco Boulevard to four lanes from Blum Road to Arthur Road, and extension of Arnold Drive from its existing easterly terminus at Pacheco Boulevard beneath I-680 to join Imhoff Drive at Blum Road.

SR-4/I-680 HOV Connection and Ramps. TRANSPAC is the sponsor of a potential future HOV connection between the existing SR-4 HOV lanes (which extend to the east on SR-4 beginning at the SR-242/SR-4 interchange area) and the HOV lanes on I-680. This would add an HOV lane connection between westbound SR-4 and southbound I-680 and between northbound I-680 and eastbound SR-4. The five phases of construction described for the I-680/SR-4 interchange project would not preclude the possible future addition of this HOV connector.

SR-4 Improvements. SR-4 has been a priority for highway improvements for many years. Recent construction has widened the existing four lanes to eight lanes between Railroad Avenue and Loveridge Road, and planned improvements will continue the roadway widening east to Somersville Road. Ultimately, the SR-4 segment from Somersville Road to SR-160 and the County line is planned to be widened from six to eight lanes.